**Amendments to the Drawings:**

The attached sheet of drawings includes a change to Figure 5. This sheet, which includes Figures 5 and 6, replaces the original sheet including Figures 5 and 6. In Figure 5, the upper chamber is now numbered as 167 to distinguish the pump element 67.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

## REMARKS

The Office Action was mailed in the present case on June 15, 2006, making a response due on or before September 15, 2006. This Amendment is being submitted, along with a Petition For Extension of Time Within the Second Month, and the required extension fee.

No additional fee is thought to be due at this time. If any additional fee is due for the continued prosecution of this application, please charge the same to Applicant's Deposit Account No. 50-2555 (Whitaker, Chalk, Swindle & Sawyer, LLP).

Applicant will first give a brief summary of the various features of the present invention:

<u>Applicant's Invention</u>: Applicant provides an energy storage device or system which can easily be added by *retrofit to an existing Freon compression air-conditioning system*, or *incorporated into new construction with an add-on package*, of the type commonly used in residential and small commercial structures. The add-on package of the invention, which creates a new system that *stores energy in a first time period, utilizes this stored energy during a second time period to cool the structure, and possesses the capacity to be able to cool the structure in a third time period without utilizing stored energy*. The system uses only energy that was previously stored by the system and *does not require any change or alteration of existing equipment* inside the structure.

Two major problems are addressed by the invention: the problem of *pumping a low viscosity and easily vaporized liquid* such as Freon is solved, and the problem of *controlling the Freon flow and charge in each time period* is solved without dependence upon the particular type of system which existed initially and was retrofitted.

The invention includes a *compressor* for compressing a refrigerant, the refrigerant being a compressible phase change fluid, and a *condensing unit* operatively connected to the compressor. An *evaporator unit* and an associated expansion means are operatively interconnected to the condensing unit and to the compressor, the evaporator unit being in heat exchange relationship with a supply air stream for an indoor space inside a structure. The compressor is operable to circulate the refrigerant between the condensing unit and the evaporator unit to cool the supply air stream.

The air conditioning system of the invention is also comprised of a *thermal energy storage*

*unit including a tank* having a thermal energy storage medium disposed therein and having an *associated heat exchanger*. The heat exchanger is operably connected to the compressor and evaporator. The thermal energy storage unit may further include a temporary refrigerant storage tank.

A refrigerant circulating device is provided for circulating refrigerant through the heat exchanger in the tank and between the tank and the condenser and evaporator. Preferably, the refrigerant circulating device includes a *prime mover and an auxiliary liquid* which is acted upon by the prime mover, the auxiliary liquid being coupled to the refrigerant, whereby force exerted by the prime mover of the auxiliary liquid is indirectly transferred to the refrigerant. In a particularly preferred system of the invention, the *prime mover is a positive displacement pump* which communicates with a pair of fluid cylinders containing oil as an auxiliary fluid. The auxiliary liquid chosen, whether oil or another liquid, has a *higher relative viscosity and a lower relative lower pressure than the conventional Freon refrigerant*. The preferred prime mover of the invention can be *powered by a direct current motor and battery*.

A valve system is also provided for controlling the flow of refrigerant through the air conditioning system. *The valve system is operative to provide three distinct time periods* of operation for the system. A *first time period allows refrigerant to flow from the condenser to the heat exchanger* of the thermal energy storage unit to freeze the medium in the tank and to then return to the condenser without utilizing the evaporator. The *second time period bypasses the condenser and circulates refrigerant through the thermal storage unit and through the evaporator* to thereby cool the supply air inside the structure before returning to the thermal storage unit. The *third time period utilizes only the temporary refrigerant storage vessel of the thermal storage unit and utilizes the condenser and evaporator* of the air conditioning system to cool the supply air inside the structure as if the thermal storage unit were not present.

Argument:

The Examiner has rejected Applicant's pending Claims 1,2,8-10,15-19, 24 and 25 under 35 U.S.C. 102(b) as being anticipated by Longardner. The Examiner has also rejected Applicant's pending Claims 3,4,7,11,14,20 and 23 under 35 U.S.C. 103(a) as being unpatentable over Longardner and

Claims 5,6,12,13,21, and 22 as being unpatentable over Longardner in view of Clark Jr.

The Examiner will appreciate that Applicant has amended the remaining claims to basically incorporate a preferred form of the invention in which the "prime mover communicates with a pair of fluid cylinders containing oil as an auxiliary fluid and wherein the prime mover exerts a motive power upon pistons located within the fluid cylinders to thereby mechanically couple the motive power of the prime mover to the refrigerant being circulated in the system" (Claim 1); and in which the "prime mover communicates with a pair of fluid cylinders containing the auxiliary fluid and wherein the prime mover exerts a motive power on a flexible bladder located within the each of the fluid cylinders to thereby couple the motive power of the prime mover to the refrigerant being circulated in the system" (Claim 6).

These preferred forms of the invention thus include the features of the fluid cylinders 59, 63 in Figure 5 of the drawings and fluid cylinders 86,88 in Figure 6. In one case, the prime mover acts on flexible bladders and in the other case, the prime mover acts on pistons in the fluid chambers. Either of these two mechanisms has been found by Applicant to overcome the first problem discussed in the Backgound discussion above relating to pumping a low viscosity and easily vaporized liquid, such as Freon. The remaining independent claims also include the features of a:

a thermal energy storage unit including a tank having a thermal energy storage medium disposed therein and having an associated heat exchanger, the heat exchanger being operably connected to the compressor and evaporator;

a refrigerant circulating device for circulating refrigerant through the heat exchanger in the tank and between the tank and the condenser and evaporator;

wherein the refrigerant circulating device includes a prime mover and an auxiliary liquid which is acted upon by the prime mover, the auxiliary liquid being coupled to the refrigerant, whereby force exerted by the prime mover on the auxiliary liquid is indirectly transferred to the refrigerant.

Applicant has canceled the remaining claims in the present case directed to the second aspect

of the invention discussed above relating to controlling Freon flow and charge in each time period of the operation of the device without prejudice toward pursuing these claims in a later filed continuing application.

The Examiner admits in the Office Action Remarks that the Longardner fails to show the feature of a "pair of fluid cylinders communicating with a prime mover" (Office Action page 7, lines 5-6). However, the Examiner cites the Clark Jr. reference in an attempt to make up this deficiency. The device shown in the Clark Jr. reference is a "new and unique thermally powered engine which may be employed as a single pair or multiple pairs of power cylinders." The thermally powered engine is made for employing a free, liquid piston common to both power and powered cylinders in combination with four rigid pistons, one in each cylinder, in a manner which permits the total force exerted by a working fluid within one of the two power cylinders to be separated into two components: (1) the force necessary to effect the return of two pistons of the engine to their starting position; and (2) the remaining net effective force which can be and is exerted by the working surface of the other piston pair of the engine to accomplish useful work; such actions taking place alternately.

Applicant is using the presently claimed fluid cylinder arrangement to overcome the problem of pumping Freon in, for example, a traditional home air conditioning system. Applicant is not attempting to create useful work to, for example, generate electricity, as in the Clark Jr. disclosure. Clark Jr. nowhere suggests that his arrangement be incorporated into a home air conditioning system to address the problem of "pump slippage" and the like, as discussed by Applicant at about Page 13, lin3 17 et. seq:

> *A further complication to the system is the viscosity of the liquid Freon. At the condensing pressure and temperature, the Freon viscosity is only about 15% that of water. Any increased backpressure on the pump discharge results in slippage of the liquid back through the pump from the discharge to the suction. This slippage greatly affects the capacity of the pump and causes eddy currents in the fluid. These eddy currents cause additional low pressure zones that cause additional flashing of the liquid to its gaseous state. Traditionally, designers have utilized increased speed of the pump, tighter clearances of the internal pump parts, and special designs of the*

*pump to control this slippage. However, these attempted solutions cause the pump price to increase dramatically and the problems are not eliminated but merely reduced. The low viscosity also affects the required seal design of the pump. Generally speaking, a sealless pump design is preferred in order to avoid problems, such as a magnetically driven pump. The requirement of a magnetically driven pump also increases the cost of the installation, however.*

Rather, Clark Jr's system is "compressing air accepted at atmospheric conditions, transfers the heat of compression to water to provide heated water, utilizes the mechanical energy of the compressed air to drive an air motor which turns an electric generator, and utilizes the cooling effect of the expanding compressed air for food refrigeration."

It would also not be logical to incorporate the fluid cylinders of Clark Jr. into the design of Longardner because of the nature of the teaching of Longardner which deals with a thermal energy storage system "for heating and cooling the interior occupied spaces of a vehicle when the vehicle engine is turned off." In Clark's system, "while the vehicle engine is operating, either heating effect from a connection to the engine's coolant system or cooling effect from a connection to the refrigerant flow in the vehicle's air conditioning system is obtained and circulated through phase change materials (PCMs) for absorption." Longardner isn't dealing with an add-on package for a traditional home air conditioning system and doesn't face the same challenges as does Applicant in the presently claimed invention.

Accordingly, reconsideration of remaining Claims 1-4 and 6-8 is respectfully requested.

Respectfully submitted,

Date: 11/15/2006

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SN 10/773,016
Annotated Sheet Showing Changes
Reply to Office Action
dated 06/15/2006





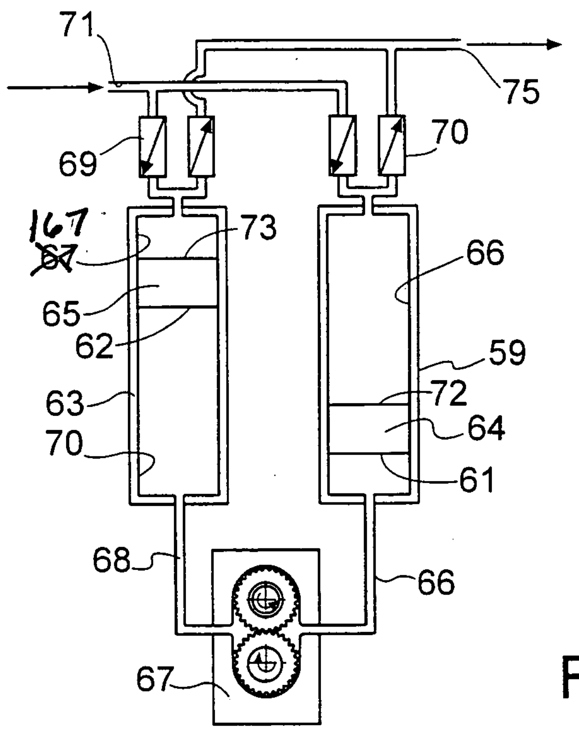


Fig. 5

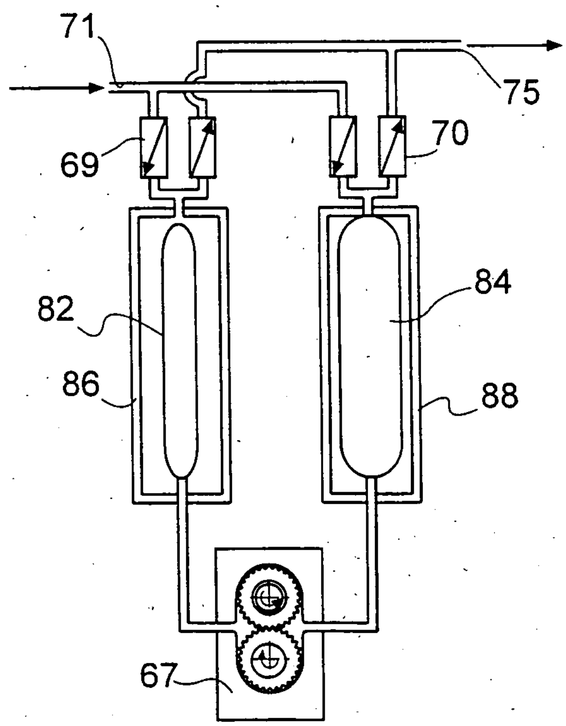


Fig. 6